FACTS ON FILE

EMSP

Environmental Management Science Program

Project Highlights

The Environmental Management Science Program (EMSP) is funding basic research projects focused on solving the most difficult problems that threaten the closure plans of DOE sites. This fact sheet highlights just one.

Containment of Toxic Metals and Radionuclides in Porous and Fractured Media: Optimizing Biogeochemical Reduction Versus Geochemical Oxidation

The overall goal of this research is to provide an improved understanding and predictive capability of the mechanisms that allow metal-reducing bacteria to be effective in the bioremediation of subsurface environments contaminated with toxic metals and radionuclides. The study is motivated by the likelihood that subsurface microbial activity can effectively alter the redox state of toxic metals and radionuclides so they are immobilized for long periods of time. The objectives are to (a) develop an improved understanding of the rates and mechanisms of competing geochemical oxidation and microbiological reduction reactions that govern the fate and transport of redox-sensitive metals and radionuclides in the subsurface and (b) quantify the conditions that optimize the microbial reduction of toxic metals and radionuclides, for the purpose of contaminant containment and remediation in heterogeneous systems.

Locations: Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Florida International University, University of Idaho

Year of Award: 1996

Amount of Award: $1,235,006

Office of Environmental Management (EM) Problem Area: Remedial Action

Office of Science (SC) Scientific Category/Sub-Category: Biogeochemistry/Biogeochemistry

Research Value/Impact: To date, this is the first research group to demonstrate the sustained microbial reduction of cobalt(III)EDTA to cobalt(II)EDTA under dynamic flow conditions. The net reduction of the cobalt(III)EDTA dominates the fate and transport of this contaminant, even in the presence of strong mineral oxidants commonly found in the subsurface. The environmental implications of these findings are pronounced since cobalt(III)EDTA is extremely stable, and this enhances its persistence and transport in subsurface environments.

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More Information on the Web:
http://www.em.doe.gov/science or
http://www.id.doe.gov/emsystems/emsp